

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A contention arbitration apparatus for arbitrating an access contention caused when a plurality of application programs simultaneously attempt to access at least one physical device, the said contention arbitration apparatus comprising:
 - a resource information storing section for storing resource information which indicates a correspondence between at least one resource, which defines functions of said the at least one physical device, and at least one application program, which is allowed to use functions associated with said the at least one resource;
 - a device information storing section for storing device information which indicates a correspondence between a logic device, which defines functions specified by said the at least one application program which attempts to access said the at least one physical device, and said the at least one resource which defines functions required for implementing functions defined by the logic device;
 - a used resource recognizing section for recognizing a resource associated with the logic device specified by said the at least one application program by reference to the device information;
 - a resource access determining section for determining, by reference to the resource information, which application program is allowed to access the resource recognized by the said used resource recognizing section; and
 - a device access determining section for determining, based on a determination result provided by the said resource access determining section, whether the application program which has specified the logic device is able to access said the at least one physical device which implements the functions defined by the logic device.
2. (Currently Amended) The contention arbitration apparatus according to claim 1, wherein the resource information contains multiple access information which indicates whether to allow simultaneous accesses from a plurality of application programs, and
 - wherein when the simultaneous accesses from the plurality of application programs are allowed, the said resource access determining section allows is operable to

allow the plurality of application programs to access the resource based on the multiple access information.

3. (Currently Amended) The contention arbitration apparatus according to claim 2, wherein the said resource access determining section allows-is operable to allow the plurality of application programs to access the resource only when a prescribed condition is satisfied.

4. (Previously Presented) The contention arbitration apparatus according to claim 3, wherein the prescribed condition is that the plurality of application programs use the same scheme to implement a function provided by the resource.

5. (Currently Amended) The contention arbitration apparatus according to claim 1, further comprising an executing section for executing a device driver for controlling said the at least one physical device when the said device access determining section determines that said-the at least one application program which has specified the logic device is allowed to access said-the at least one physical device.

6. (Currently Amended) The contention arbitration apparatus according to claim 5, wherein the said executing section sends-is operable to send an error message to said-the at least one application program having specified the logic device when the said access determining section determines that said-the at least one application is not allowed to access said-the at least one physical device.

7. (Currently Amended) The contention arbitration apparatus according to claim 1, wherein the said resource access determining section determines-is operable to determine which application program is allowed to access said-the at least one physical device based on priorities of the plurality of application programs.

8. (Previously Presented) The contention arbitration apparatus according to claim 7, further comprising an application information storing section for storing information about the priorities of the plurality of application programs.

9. (Currently Amended) The contention arbitration apparatus according to claim 7, wherein the resource information contains additional information which indicates whether to grant an access right to an application program having provided an access indication first or last; and

wherein when the plurality of application programs have the same priorities, the said resource access determining section determines-is operable to determine which one of the application programs is to be granted the access right based on the additional information.

10. (Currently Amended) The contention arbitration apparatus according to claim 1, further comprising:

an application information storing section for storing, as application information, a correspondence between a determination result obtained by the-said device access determining section and the plurality of application programs; and

an executing section for executing a device driver for controlling said-the at least one physical device,

wherein when an access start indication is provided by an application program to specify the logic device, the-said device access determining section determines-is operable to determine whether the application program is able to access said-the at least one physical device and stores-store a determination result into the-said application information storing section; and

wherein when an access indication is provided after the access start indication, the-said executing section refers-is operable to refer to the application information stored in the-said application information storing section to determine whether the application program is able to access said-the at least one physical device.

11. (Currently Amended) The contention arbitration apparatus according to claim 10, wherein when an access indication is provided by an application program which is not able to access saidthe at least one physical device, thesaid executing section sendsis operable to send an error message to the application program.
12. (Currently Amended) The contention arbitration apparatus according to claim 10, wherein when an access indication is provided by an application program[[],] which is not allowed to access saidthe at least one physical device since access to saidthe at least one physical device is granted to another application program, thesaid executing section sendsis operable to send an error message to the application program.
13. (Currently Amended) The contention arbitration apparatus according to claim 1, wherein upon receipt of an access termination indication from saidthe at least one application program, thesaid resource access determining section grantsis operable to grant an access right to another application program which attempts to use the functions associated with the resource and updatesupdate the resource information such that a result of the grant of the access right is reflected in the resource information; and wherein thesaid device access determining section determinesis operable to determine whether saidthe another application program is able to access saidthe at least one physical device based on the resource information updated by thesaid resource access determining section.
14. (Currently Amended) The contention arbitration apparatus according to claim 13, further comprising:
- an application information storing section for storing, as application information, a correspondence between a determination result obtained by thesaid device access determining section and the plurality of application programs; and
- an executing section for updating the application information based on the determination result obtained by thesaid device access determining section.

15. (Currently Amended) The contention arbitration apparatus according to claim 13, further comprising an executing section for changing a setting of a device driver when the said device access determining section determines that said-the another application program is able to access said-the at least one physical device, the setting being changed such that said-the another application program is allowed to access the at least one physical device.

16. (Currently Amended) The contention arbitration apparatus according to claim 1, wherein when only said-the at least one application program, which specifies the logic device, is allowed to use the functions associated with all the resources associated with the logic device, the-said device access determining section determines-is operable to determine that said-the at least one application program is allowed to use said-the at least one physical device.

17. (Currently Amended) The contention arbitration apparatus according to claim 1, wherein when only said-the at least one application program, which specifies the logic device, is associated with a part of the resources associated with the logic device, the-said device access determining section determines-is operable to determine that said-the at least one application program is allowed to use functions defined by the part of the resources when accessing said-the at least one physical device.

18. (Currently Amended) The contention arbitration apparatus according to claim 1, further comprising an application I/F section for accepting a specification of the logic device from said-the at least one application program.

19. (Currently Amended) The contention arbitration apparatus according to claim 1, wherein the resource information contains additional information which indicates for each resource whether to grant an access right to an application program having provided an access indication first or last; and

wherein the said resource access determining section determines is operable to determine which application program is granted the access right based on the additional information.

20. (Currently Amended) A contention arbitration program, stored in a memory, for causing a computing apparatus to arbitrate an access contention caused when a plurality of application programs simultaneously attempt to access at least one physical device, the computing apparatus having stored therein resource information which indicates a correspondence between at least one resource, which defines functions of said the at least one physical device, and at least one application program, which is allowed to use functions associated with said the at least one resource, and also having stored therein device information which indicates a correspondence between a logic device, which defines functions specified by said the at least one application program which attempts to access said the at least one physical device, and said the at least one resource which defines functions required for implementing functions defined by the logic device, the said contention arbitration program causing the computing apparatus to perform a contention arbitration method comprising the steps of:

recognizing a resource associated with the logic device specified by said the at least one application program by reference to the device information;

determining, by reference to the resource information, which application program is allowed to access the recognized resource; and

determining, based on a determination result obtained by the step of in said determining, by reference to the resource information, which application program is allowed to access the recognized resource, whether the application program which has specified the logic device is able to access said the at least one physical device which implements the functions defined by the logic device.

21. (Currently Amended) A contention arbitration method for causing a computing apparatus to arbitrate an access contention caused when a plurality of application programs, stored in a memory, simultaneously attempt to access at least one physical device, the computing apparatus having stored therein resource information which

indicates a correspondence between at least one resource, which defines functions of said the at least one physical device, and at least one application program, which is allowed to use functions associated with said the at least one resource, and also having stored therein device information which indicates a correspondence between a logic device, which defines functions specified by said the at least one application program which attempts to access said the at least one physical device, and said the at least one resource which defines functions required for implementing functions defined by the logic device, the said contention arbitration method comprising the steps of:

recognizing a resource associated with the logic device specified by said the at least one application program by reference to the device information;

determining, by reference to the resource information, which application program is allowed to access the recognized resource; and

determining, based on a determination result obtained by the step of in said determining, by reference to the resource information, which application program is allowed to access the recognized resource, whether the application program which has specified the logic device is able to access said the at least one physical device which implements the functions defined by the logic device.